PHILIPS

Advanced molecular imaging

Improving detectability and characterization of small lesions

PURPOSE OF STUDY

PET is an integral part of the care cycle for patients with oncologic diseases. Recent advances in PET detector scintillation technology, such as Digital Photon Counting (DPC), have enabled quantitative PET imaging for improved lesion characterization and treatment monitoring. A study was conducted by researchers and clinicians from Case Western Reserve University/University Hospitals Case Medical Center, Cleveland, Ohio comparing DPC technology (digital) and conventional photomultiplier detector system (analog*).The aim of this study was to evaluate the image quality and diagnostic performance of the DPC with Time of Flight (TOF) technology in oncologic patients undergoing clinical PET/CT scanning, compared with the analog PET system with TOF. The following is a summary of the study published in the Journal of Nuclear Medicine.

Overview

Radiation oncology requires high quality imaging to create and calculate accurate treatment plans. Image quality parameters are important considerations in assuring accuracy. This study included 21 oncologic patients, mean age 58y, that first underwent clinical 18F-FDG PET/CT on the analog system. The scanner table was withdrawn while the patient remained on the table and a digital system was inserted between the analog PET and CT scanner. The patients were scanned for a second time using the same PET field of view with CT from the analog system for attenuation correction. Images were reviewed for overall image quality, lesion conspicuity, and sharpness by two independent reviewers. The number of suggestive 18F-FDG-avid lesions and provided the Tumor Size, Nodes, and Metastasis (TNM) staging for the 5 patients referred for initial staging were quantified. Standardized Uptake Values (SUVs) and SUV gradients were used to determine lesion sharpness.

Results

This comparative study of digital PET and analog PET observed an appreciable improvement in the image quality of digital PET over the conventional analog PET images. In a side-by-side comparison with TOF technology, using a 5-point scale, lesion conspicuity, lesion sharpness, and diagnostic confidence were better with digital PET than with an analog PET system. The lesion maximum SUV, lesion-to-

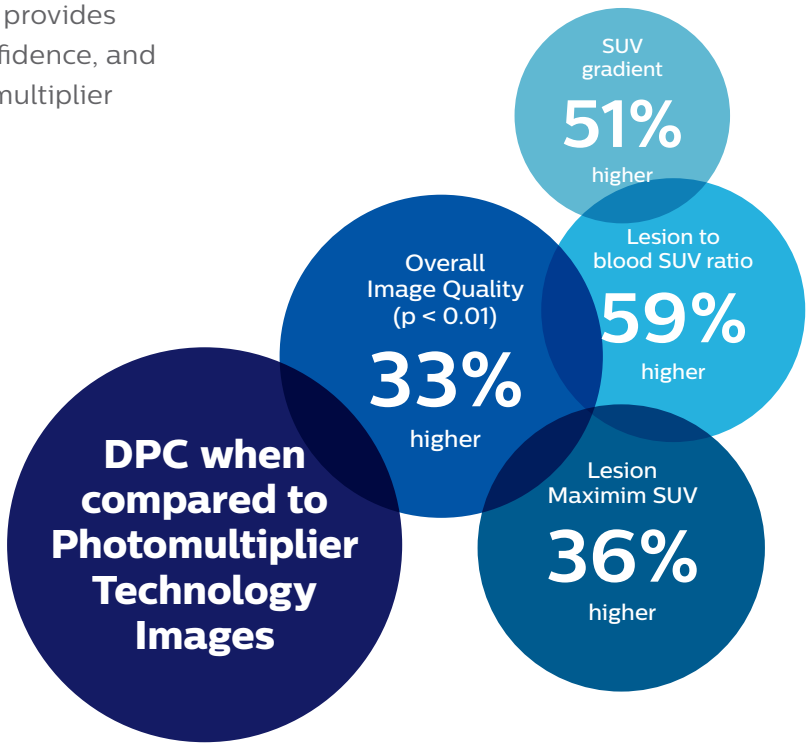
blood-pool SUV ratio, and SUV gradient were all higher in the digital PET, with good correlation between the two scanners. Additionally, in five of 21 patients, Digital PET showed an additional eight suggestive lesions (0.5-0.9 cm) that were not seen using analog PET. In the 15 restaging patients, true-negative rate was 100% and true-positive rate was 78% for both scanners. In the five patients for initial staging, digital PET led to upstaging in two patients and showed the same staging in the as the analog PET in the remainder.

Conclusion

Digital Photon Counting technology provides better image quality, diagnostic confidence, and accuracy than the traditional photomultiplier technology used in analog PET.

CLINICAL RELEVANCE

Digital Photon Counting technology based PET systems provide advantages over analog PET in detecting small tumor lesions and disease staging by contributing to upstaging. Using the digital PET/CT system, additional suggestive lesions (0.5-0.9 cm) not visible with analog PET can be detected.



*GEMINI TF

Nguyen NC, Image Quality and Diagnostic Performance of a Digital PET Prototype in Patients with Oncologic Diseases: Initial Experience and Comparison with Analog PET, J Nucl Med 2015; 56:1378–1385

Results from case studies are not predictive of results in other cases. Results in other cases may vary.

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